

ABSTRACT

A magnetron sputtering system is provided comprising a pulsed DC power supply capable of delivering peak powers of 0.1 megaWatts to several megaWatts with a peak power density greater than $1\text{kW}/\text{cm}^2$. A sputtering plasma in a highly ionized state is created without first adopting an arc discharge state. The power supply has a pulsing circuit comprising an energy storage capacitor and serially connected inductor with a switching means for disconnecting the pulsing circuit from the plasma and recycling the inductor energy back to the energy storage capacitor at the detection of an arc condition. The energy storage capacitor and the serially connected inductor provide an impedance match to the plasma, limits the current rate of rise and peak magnitude in the event of an arc, and shapes the voltage pulses to the plasma.